DOE/NV/25946--609

U.S. Department of Energy Consequence Management Under the National Response Framework

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Operated by National Security Technologies, LLC (NSTec), for the

U.S. Department of Energy,
National Nuclear Security Administration
Nevada Site Office (NNSA/NSO)

This work was done by National Security Technologies, LLC, under Contract No. DE-AC52-06NA25946 with the U.S. Department of Energy.

National Response Framework (NRF)

- Guide to how the nation conducts all-hazard incident response:

  Nuclear/Radiological Incident Annex (NRIA)

- Describes the policies, situations, concepts, and responsibilities of the Federal Departments and Agencies activities for incidents involving release of radioactive materials.
- Identifies several categories of potential incidents and impacted entities.
- Describes how other Federal Departments and Agencies support the Department of Homeland Security when Department of Homeland Security (DHS) leads a large-scale multi-agency Federal response.

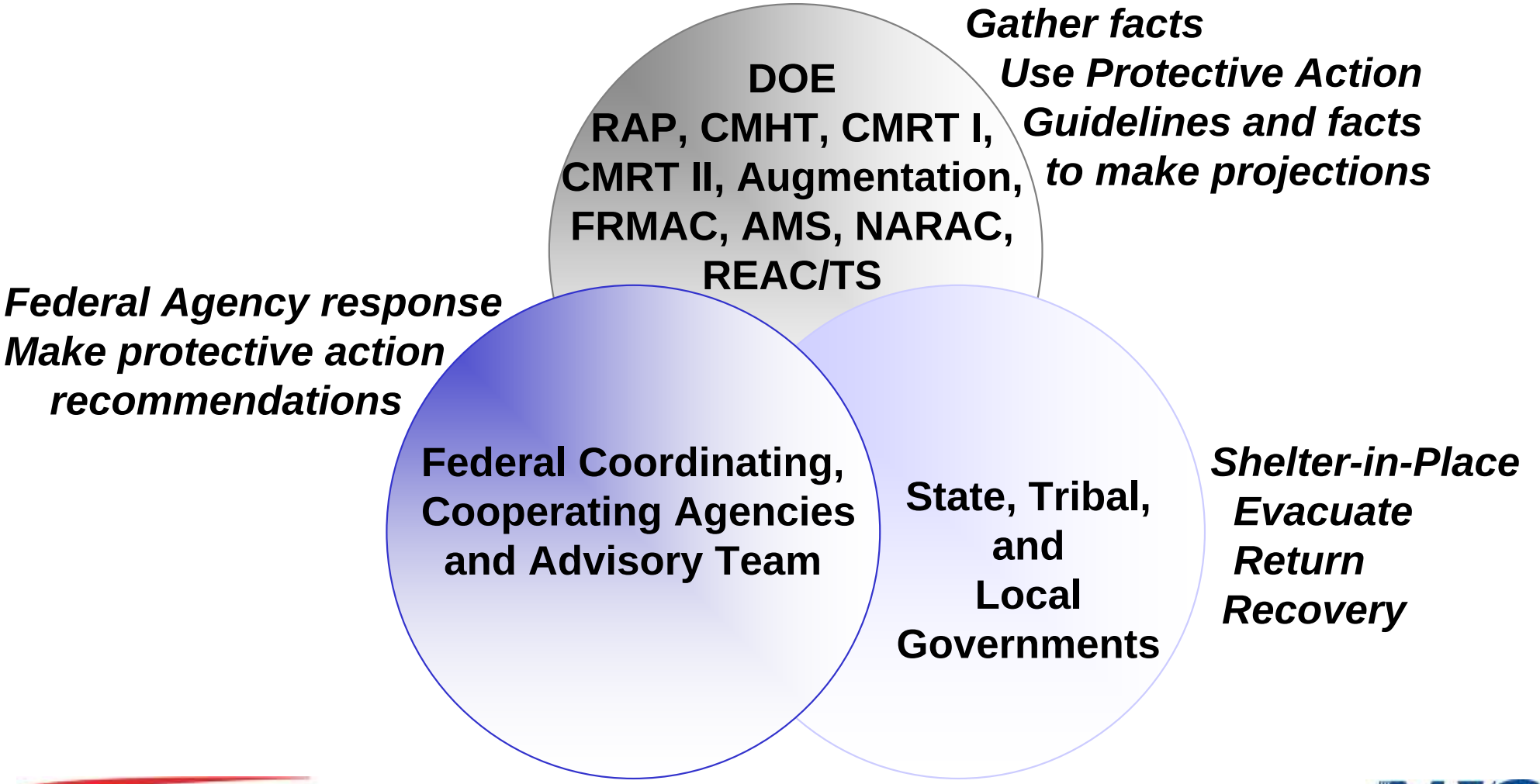
Federal Radiological Monitoring and Assessment Center (FRMAC)

- FRMAC is identified in Key Federal Radiological Resources/Assets section of the NRIA.
- FRMAC is responsible for coordinating all Federal environmental radiological monitoring, sampling, and assessment activities for the response
- FRMAC is a DOE-led interagency asset for the initial response supporting the Coordinating Agency, then transitions FRMAC leadership to Environmental Protection Agency (EPA) for site cleanup.

Purpose of FRMAC

- Assist the States, Tribal and Local Governments in their mission to protect the health and well being of their citizens:
  - Provide initial prediction based on source term estimate.
  - Verify and validate release prediction based on ground monitoring data and fixed wing surveys.
  - Comprehensive characterization of environmental and public impacts based on ground monitoring, sampling and analysis, and rotary-wing survey data.

Coordinated Radiological Emergency Response



Federal Response

- NRIA applies whenever a Federal response is undertaken pursuant to Federal authorities.
  - Or when an incident exceeds or is anticipated to exceed State, Tribal, or Local Government resources.

- Level of Federal response is based on the ability of State, Tribal, or Local Government officials to respond to:
  - Type, amount, and custody of radioactive materials involved.
  - Extent of the impact or potential impact on the public and environment.
  - Size of affected area.

NRIA Nuclear/Radiological Facilities or Materials Involved in Incident

- Nuclear facilities
- Radioactive materials being transported
- Radioactive materials in space vehicles impacting within the United States
- Foreign, unknown, or unlicensed material
- Nuclear weapons
- Radiological dispersion device (RDD) or improvised nuclear device (IND)

NRIA Nuclear/Radiological Facilities or Materials Involved in Incident

Nuclear facilities:

(1) Owned or operated by **DOD** or **DOE.**

(2) Licensed by **NRC** or Agreement State.

(3) Not licensed, owned, or operated by a Federal agency or an Agreement State, or currently or formerly licensed facilities for which the owner/operator is not financially viable or is otherwise unable to respond, **EPA.**

NRIA Nuclear/Radiological Facilities or Materials Involved in Incident (continued)

Radioactive materials being transported:

(1) Materials shipped by or for **DOD** or **DOE**

(2) Shipment of **NRC** or Agreement State-licensed materials

(3) Shipment of materials in certain areas of the coastal zone that are not licensed or owned by a Federal agency or Agreement State (see **DHS/USCG** list of responsibilities for further explanation of "certain areas")

(4) All others, **EPA**

NRIA Nuclear/Radiological Facilities or Materials Involved in Incident (continued)

Radioactive materials in space vehicles impacting within the United States:

(1) Managed by **NASA** or **DOD.**

(2) Not managed by DOD or NASA impacting certain areas of the coastal zone, **DHS/USGS.**

(3) All others, **EPA.**

NRIA Nuclear/Radiological Facilities or Materials Involved in Incident (continued)

Foreign, unknown or unlicensed material:

(1) Incidents involving inadvertent import of radioactive materials, **DHS/CBP.**

(2) Incidents involving foreign or unknown sources of radioactive material in certain areas of the coastal zone, **DHS/USCG.**

(3) All others not otherwise assigned to DHS/CBP or DHS/USCG, **EPA.**

NRIA Nuclear/Radiological Facilities or Materials Involved in Incident (continued)

Nuclear weapons:

- **DOD or DOE** (based on custody at time of incident)

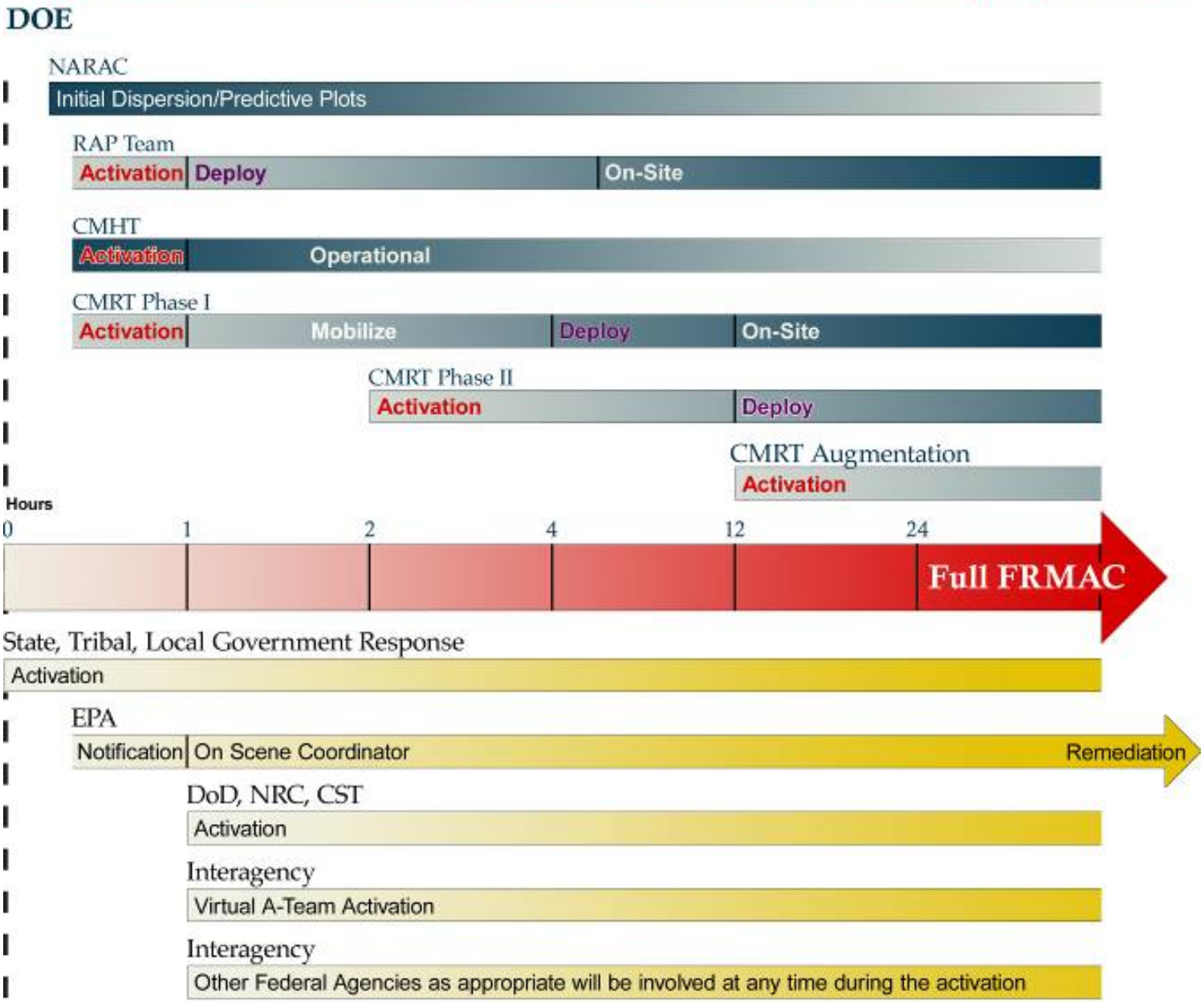
Radiological dispersion device (RDD) or improvised nuclear device (IND):

- **DHS**

DOE Consequence Management (CM) Response

- Activation may be requested based on “release or potential release of radioactive material that poses an actual or perceived hazard to public health.”
- CM will generally not be present during plume passage. The primary incident release has occurred and assistance was requested by the state after some delay.
- Exercise scenario timelines generally have the release terminated, and plume passage and deposition complete before CM would arrive.
- For some incidents, a response may be requested before a primary release has occurred. For example:
  - Nuclear Power Plant in an unstable condition
  - Other unstable situation
  - NASA launch carrying radiological material

Approximate Readiness Time After Activation –Emergency Phase



This chart Describes the approximate timeline for DOE's establishment and management of the FRMAC in the emergency phase

NASA Launch Scenario

- Unique situation where you know the time of a potential release.
- Even with very low risk you have a potential for release.
- Advance Launch Support Group (ALSG) is a CM contingency response group in place before launch.
- All the major elements of a CM response are pre-staged with the addition of a pre-plume strategy.
- Contingency groups have supported all NASA launches with major Radioisotope Thermoelectric Generators (Galileo, Ulysses, Cassini, Mars Missions and Pluto New Horizons).

Delta V and New Horizons

- Pluto New Horizons
  Launched January 19, 2006

- Same launch vehicle for Mars Science Laboratory (MSL)

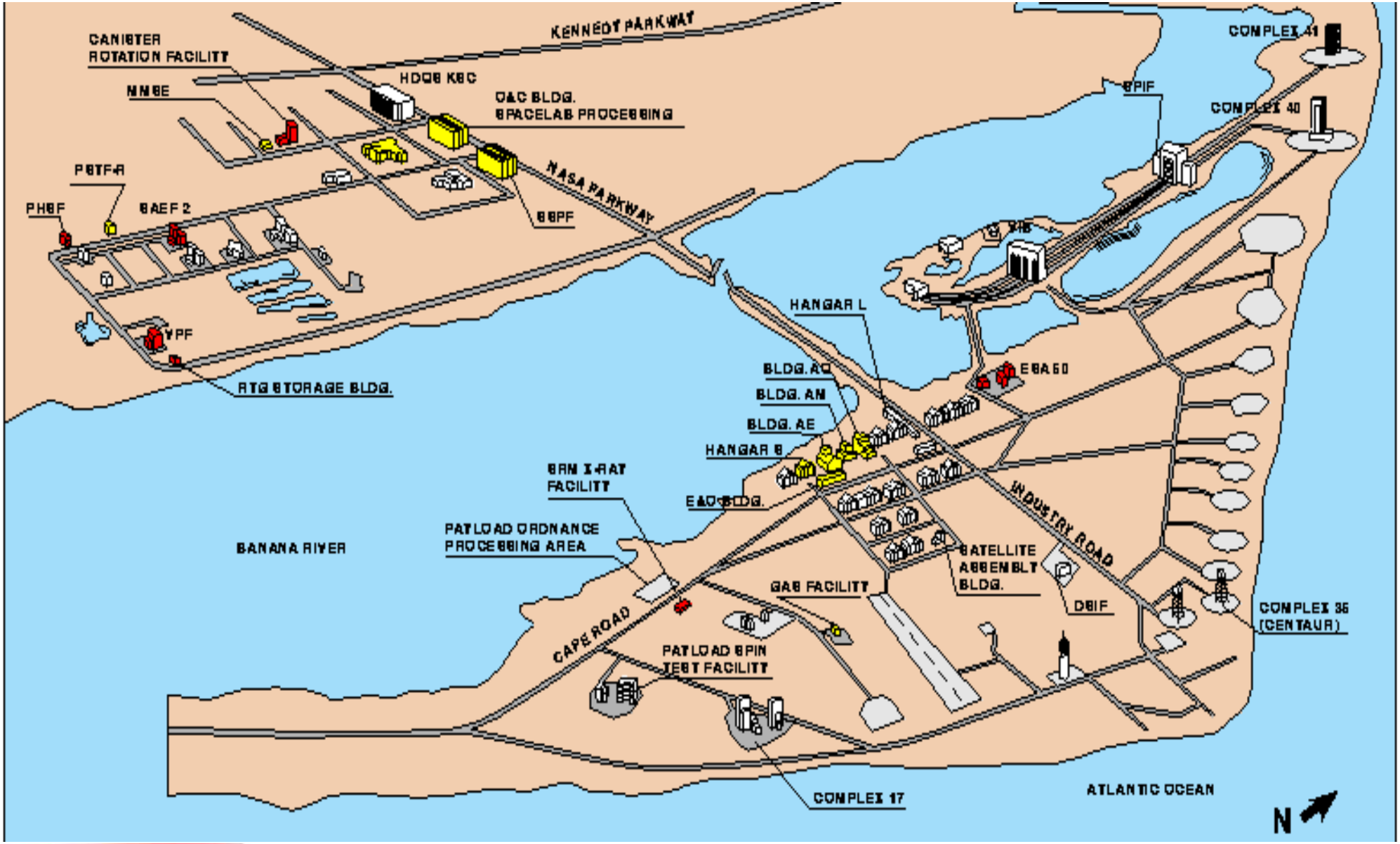
Mars Science Laboratory


Explorer I
Explorer I

Three Incident Scenarios

- Launch Area Accident T-0 thru T+40 seconds. Includes accident during field deployment prior to launch (i.e., after Multi-Mission Radioisotope Thermoelectric Generator [MMRTG] installation).
- Orbital Reentry (hours to days after launch).
- Offshore accident, i.e., at T+50 seconds.

Cape Canaveral

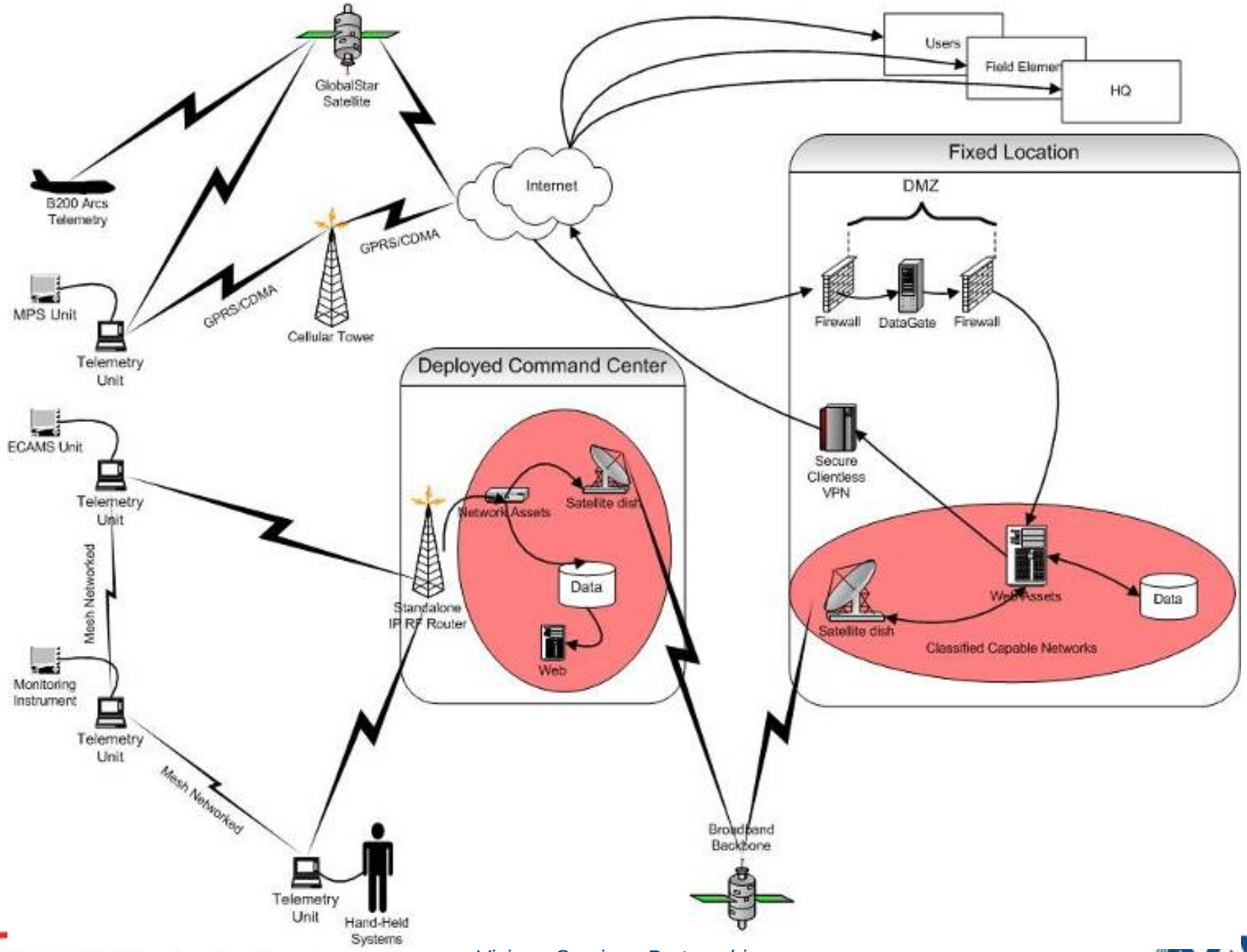


Field Team Instrument and Equipment

Onsite/Offsite Radiation Monitoring (Radmon) Teams Configuration

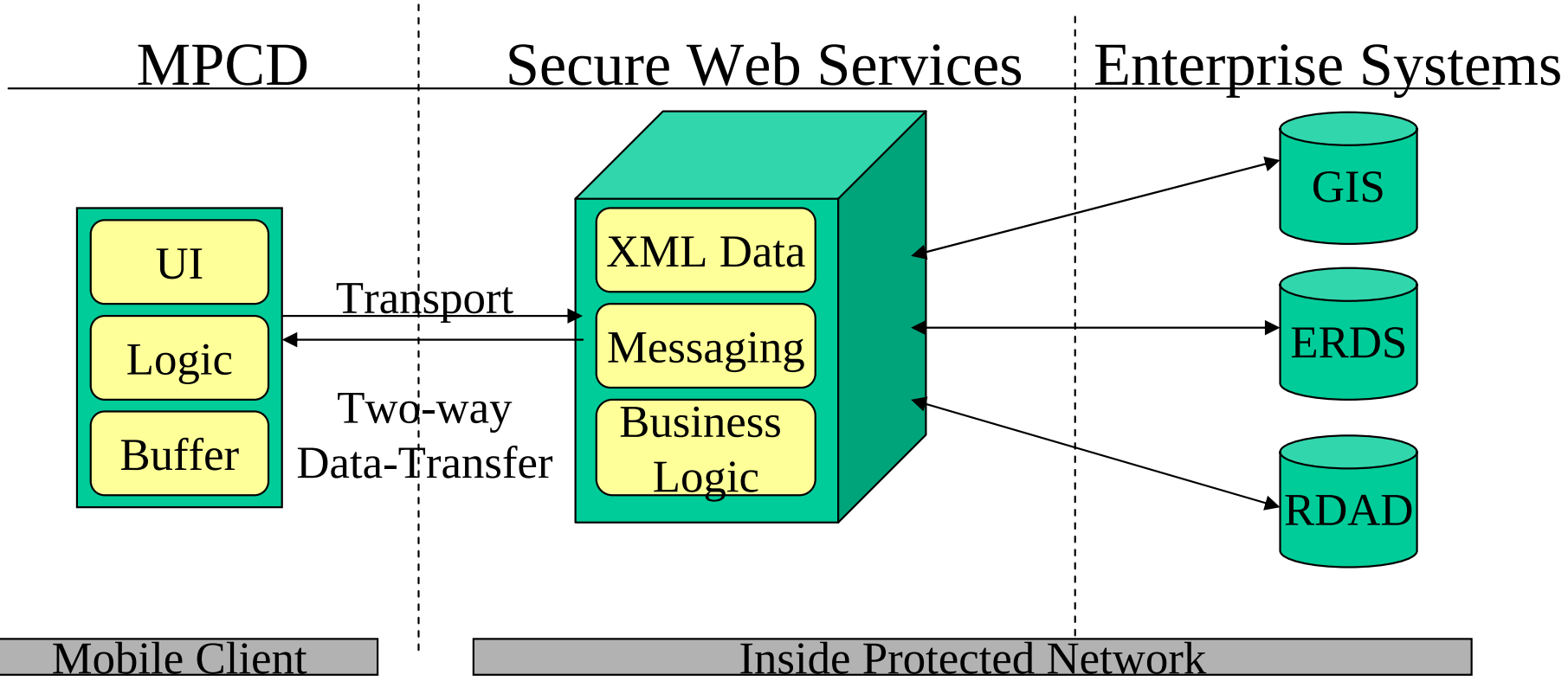
- ~60 personnel (field, support, command and control)
  - Onsite – approximately 6-7 teams for CCAFS/KSC monitoring
  - Offsite – approximately 10 teams/30 locations for offsite monitoring
- Instrumentation (subject to change pending discussions with state and county and development of the MSL Monitoring Plan)
  - 4-inch Hi-Volume Air Samplers / Portable Generators
  - Violinists/FIDLERs
  - Alpha Survey Meters
  - Environmental Sample Collection Tools, as required
- 15 Environmental Continuous Air Monitoring (ECAM) units at strategic locations.

Multipath Communication Device (MPCD)



Multipath Communication Device (MPCD)

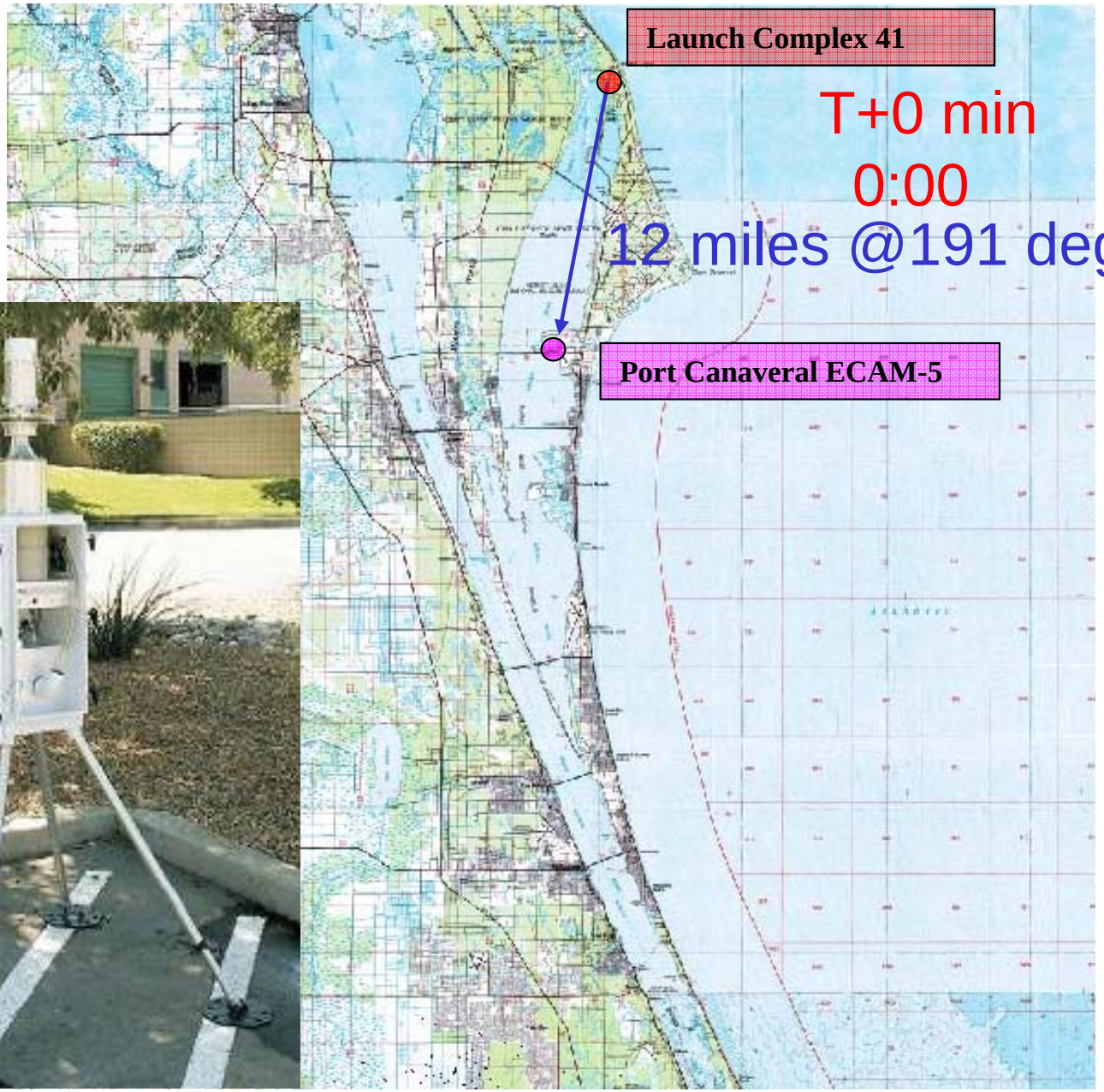
- GUI application for data acquisition
- Transmission application (MPCD)
- Server based data capture
- Real-time viewer
- Archival system

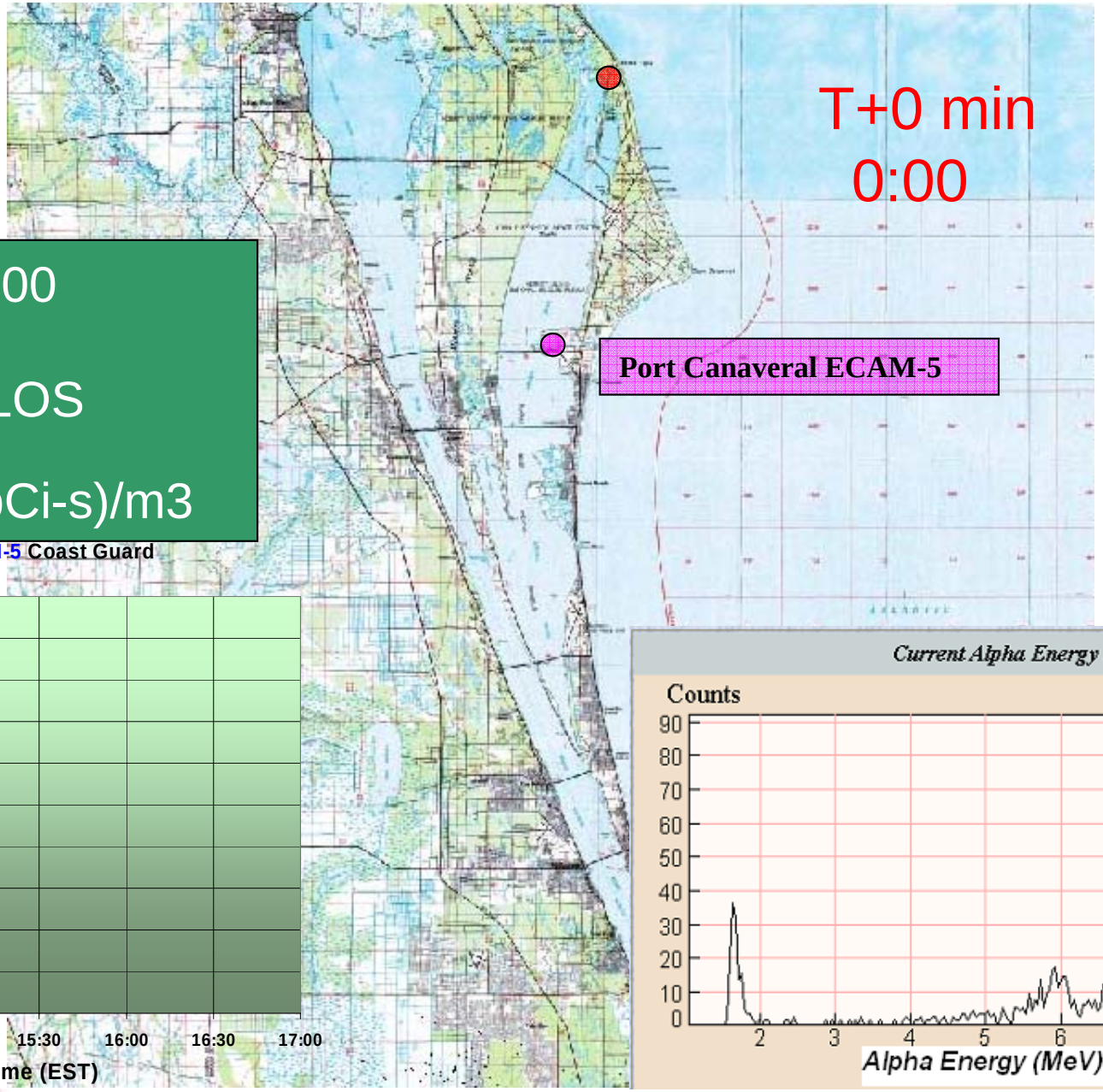


Multipath Communication Device (MPCD)

- Multi–Path:
  - Standalone – Mesh Networked IP RF
  - Commercial – GPRS, CDMA, GlobalStar
  - Connections – Serial, Ethernet, Bluetooth, 802.11b/g
- Multi–Platform:
  - Mobile Vehicle, Static Sensors, Aerial
  - Software Dynamic / Flexible Hardware Configuration

802.11g Data Stream

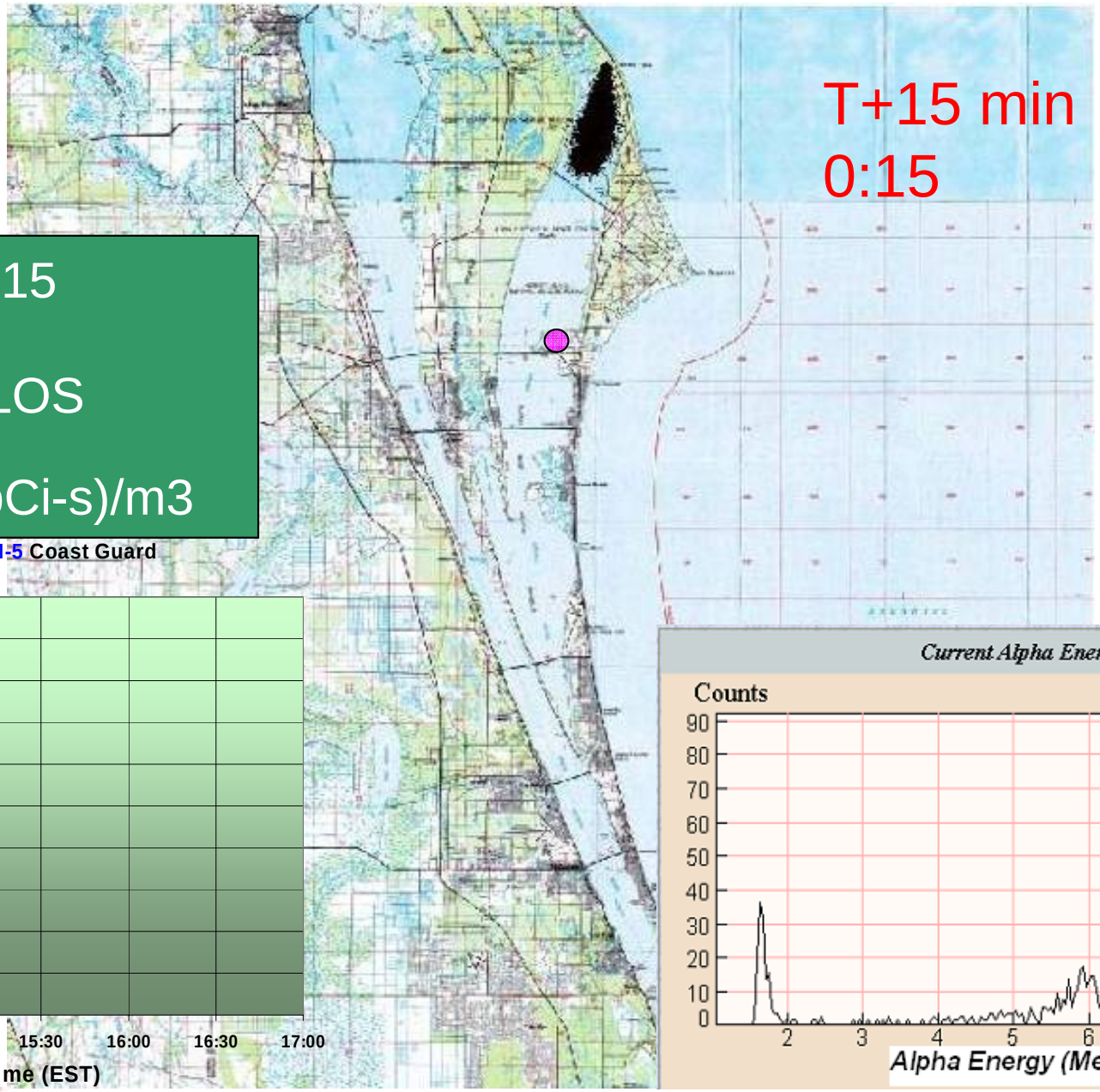

Launch Complex 41
T+0 min
0:00
12 miles @191 deg
Port Canaveral ECAM-5



ECAM 5 14:00

(pCi-s)/m3: LOS

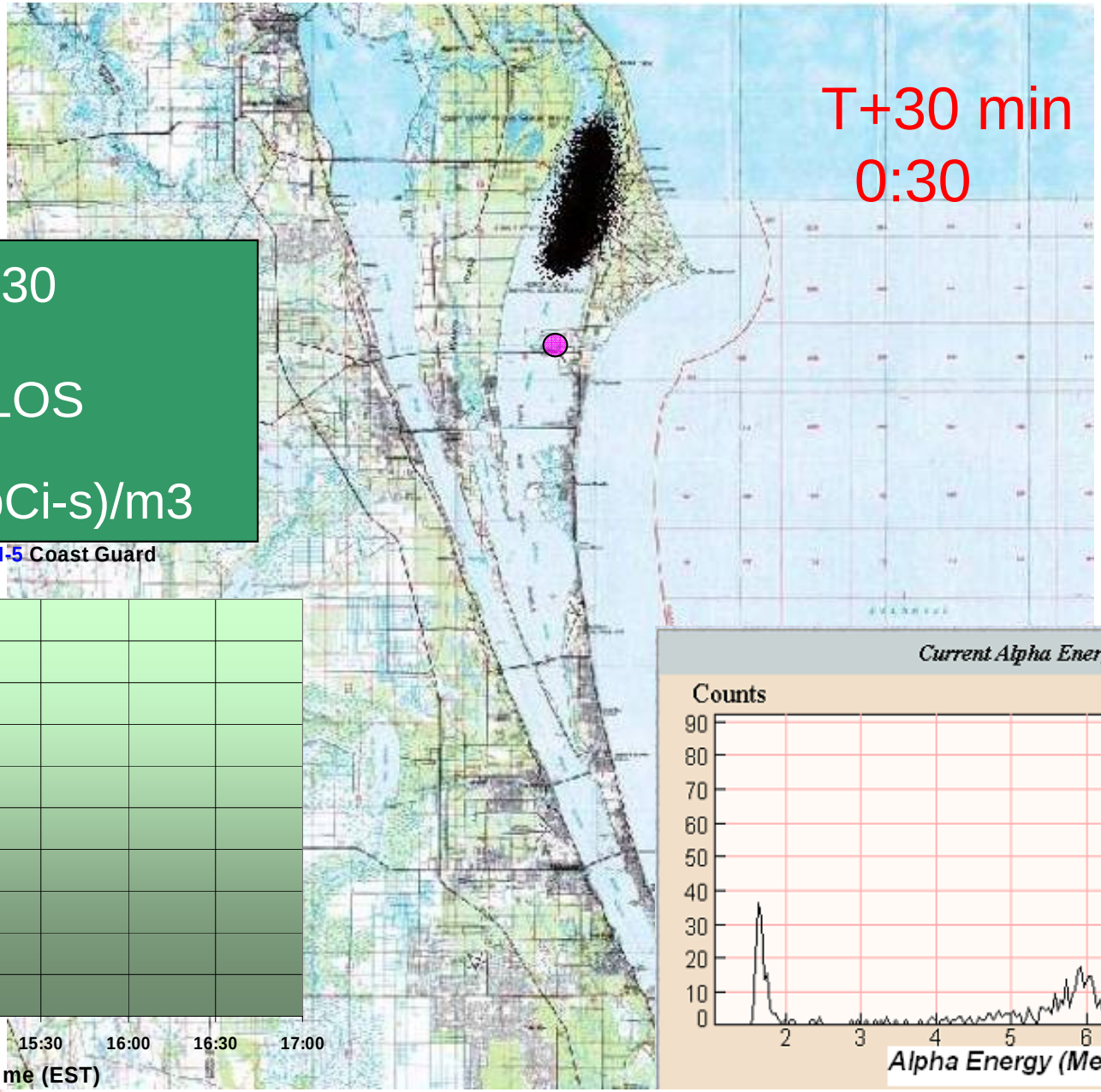
LOS: 170 (pCi-s)/m3

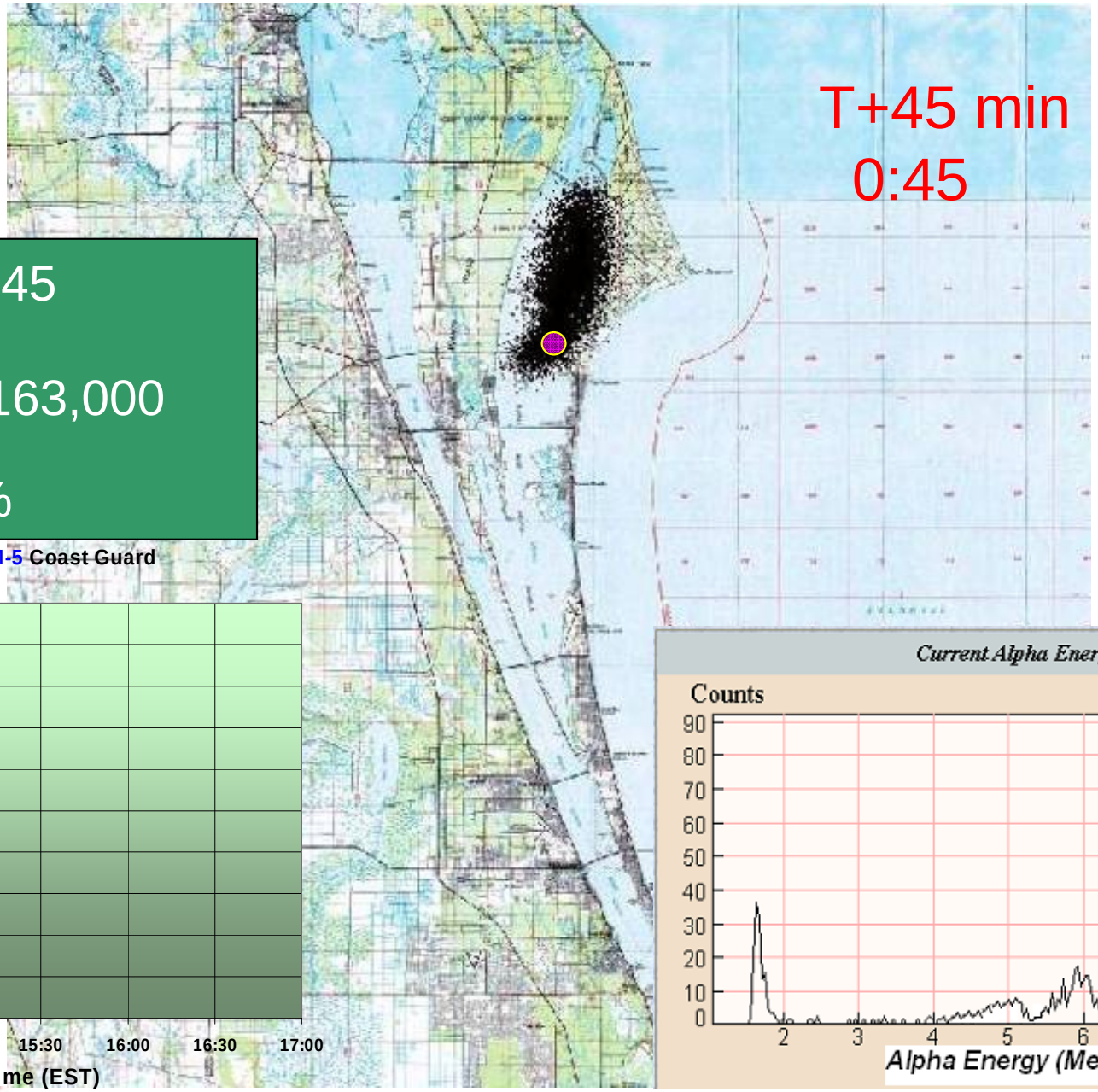


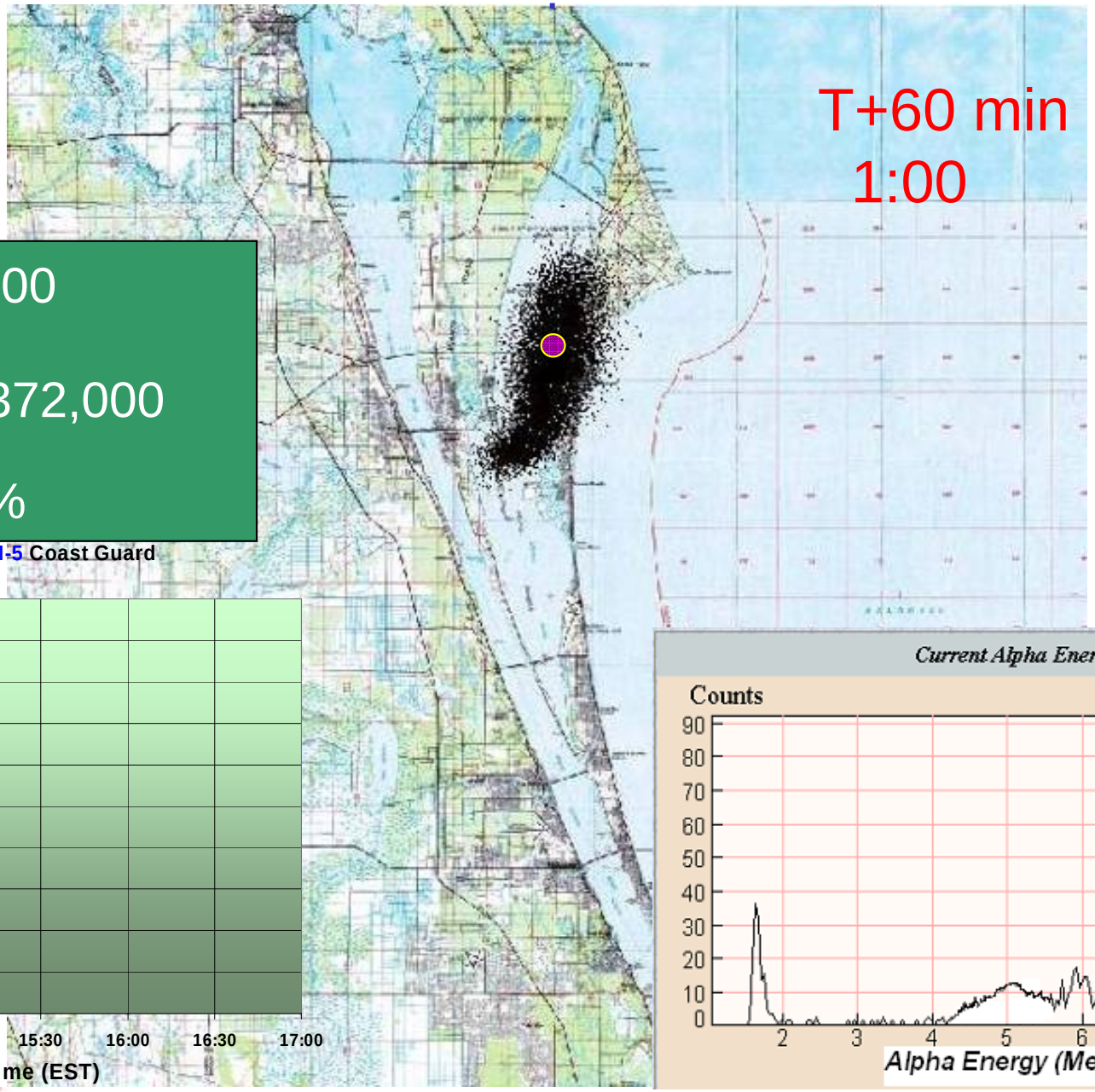
ECAM 5 14:15

(pCi-s)/m3: LOS

LOS: 170 (pCi-s)/m3


T+30 min
0:30
ECAM 5 14:30
(pCi-s)/m3: LOS
LOS: 170 (pCi-s)/m3
ECAM-5 Coast Guard
Pu-238 Air Concentration - pCi/m3
500
450
400
350
300
250
200
150
100
50
0
14:00
14:30
15:00
15:30
16:00
16:30
17:00
Time (EST)
Current Alpha Energy Spectrum
Counts
90
80
70
60
50
40
30
20
10
0
2
3
4
5
6
7
8
9
10
Alpha Energy (MeV)

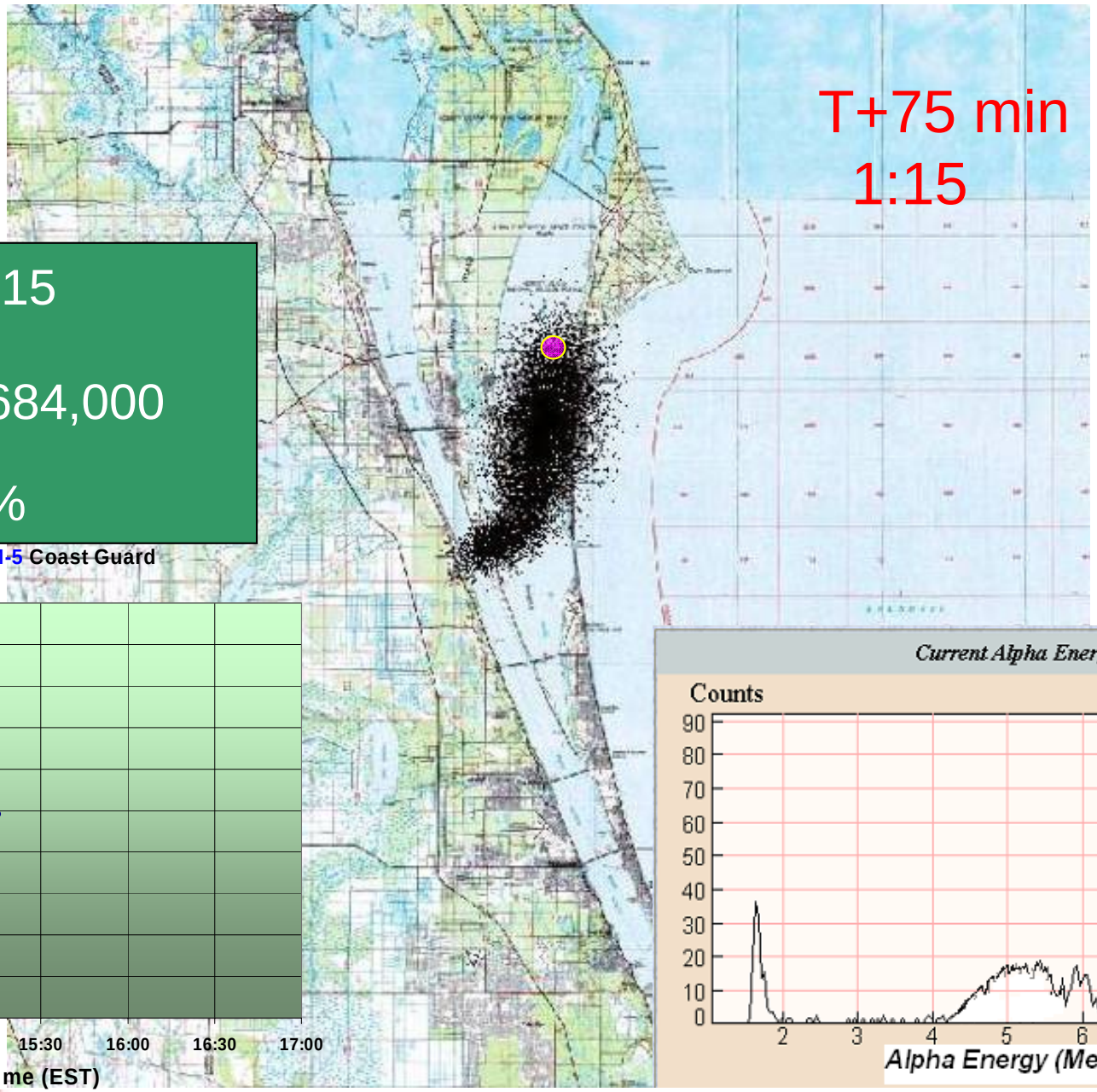

T+45 min
0:45
ECAM 5 14:45
(pCi-s)/m3: 163,000
SDEV: 17 %
ECAM-5 Coast Guard
Pu-238 Air Concentration - pCi/m3
500
450
400
350
300
250
200
150
100
50
0
14:00
14:30
15:00
15:30
16:00
16:30
17:00
Time (EST)
Current Alpha Energy Spectrum
Counts
90
80
70
60
50
40
30
20
10
0
2
3
4
5
6
7
8
9
10
Alpha Energy (MeV)

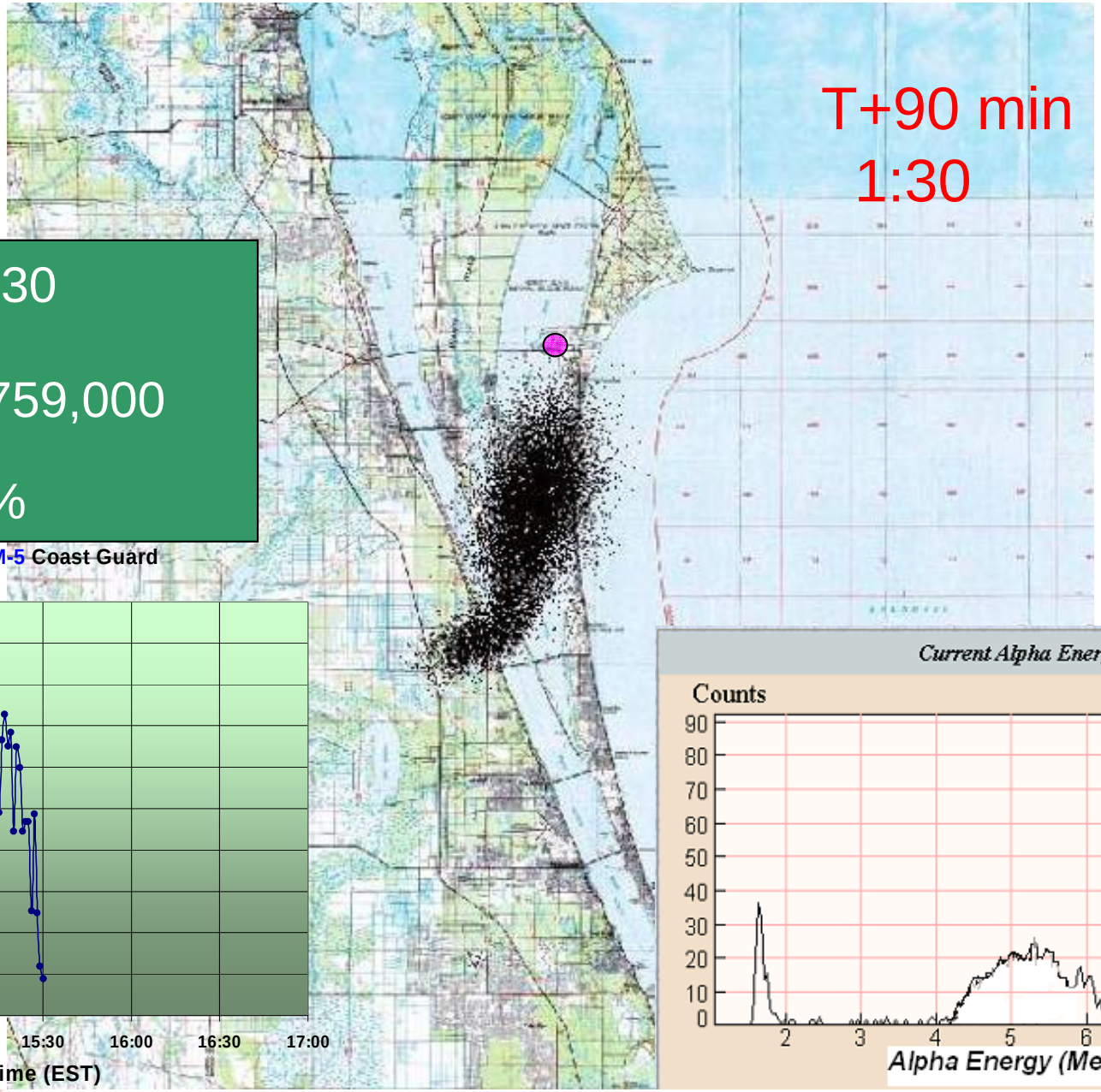


ECAM 5 15:00

(pCi-s)/m3: 372,000

SDEV: 8.5 %


T+75 min
1:15
ECAM 5 15:15
(pCi-s)/m3: 684,000
SDEV: 6.9 %
ECAM-5 Coast Guard
Pu-238 Air Concentration - pCi/m3
500
450
400
350
300
250
200
150
100
50
0
14:00
14:30
15:00
15:30
16:00
16:30
17:00
Time (EST)
Current Alpha Energy Spectrum
Counts
90
80
70
60
50
40
30
20
10
0
2
3
4
5
6
7
8
9
10
Alpha Energy (MeV)



ECAM 5 15:30

(pCi-s)/m3: 759,000

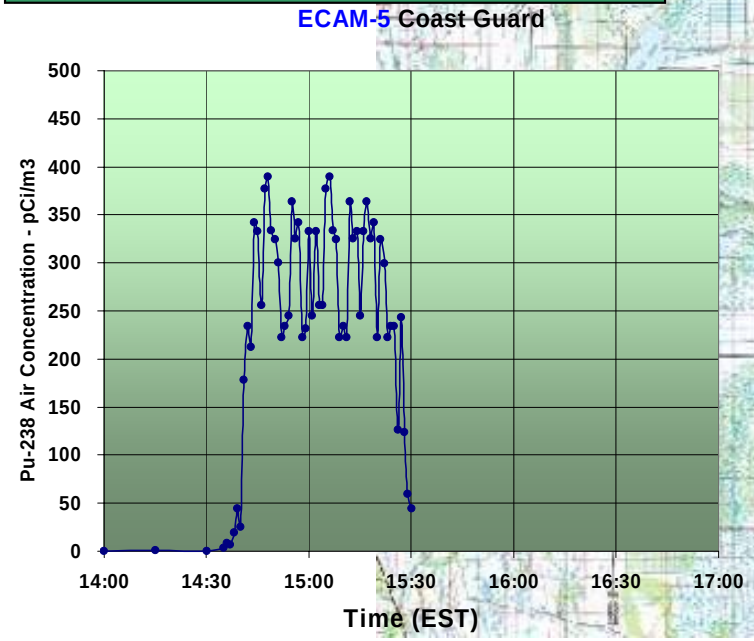
SDEV: 7.1 %

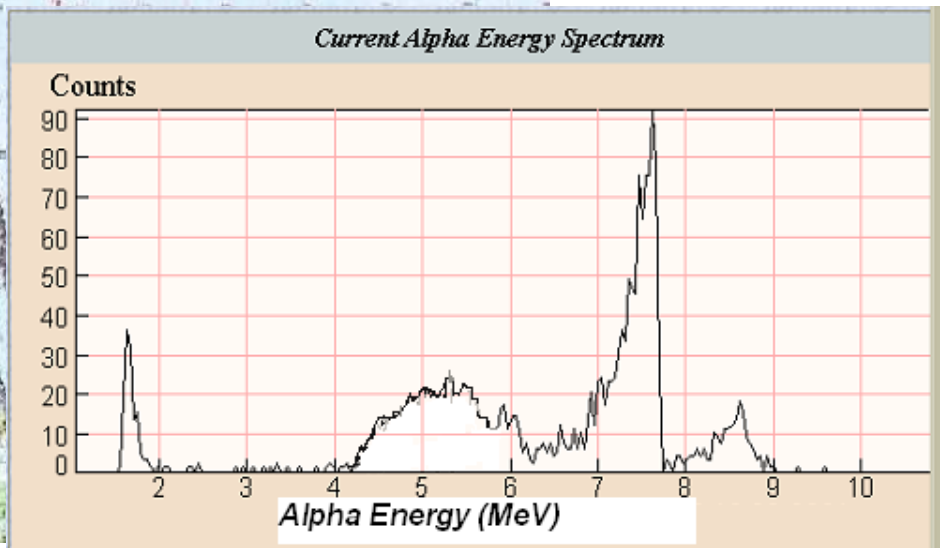
T+105 min
1:45

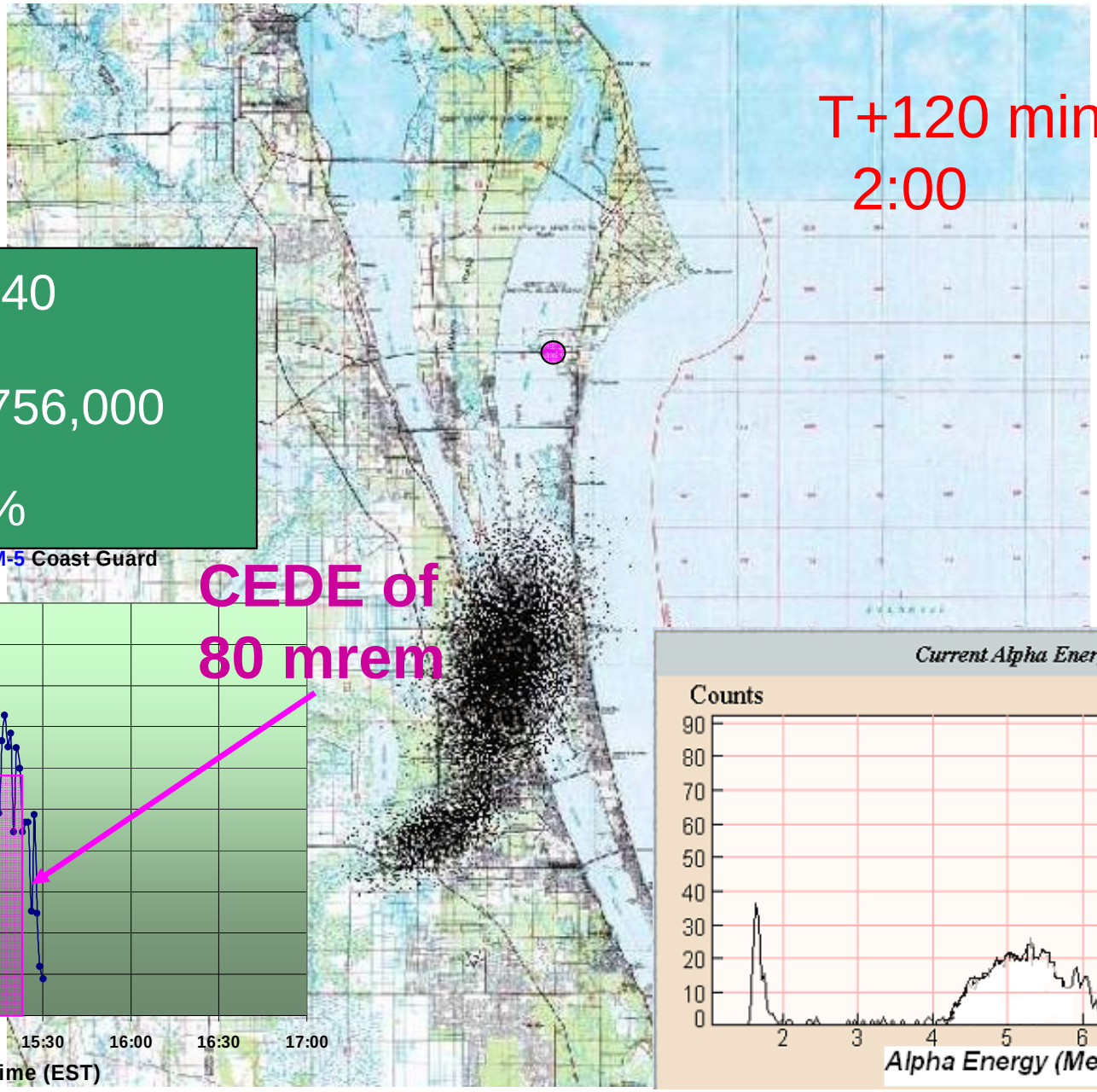
ECAM 5 15:40

(pCi-s)/m3: 756,000

SDEV: 6.7 %







T+120 min
2:00

ECAM 5 15:40

(pCi-s)/m3: 756,000

SDEV: 6.7 %

CEDE of 80 mrem

Summary

- Plan using:
  - Safety analysis reports and release modeling
  - Lessons learned from past launches
- Employ newly developed technologies:
  - Environmental Continuous Air Monitoring System (ECAMS)
  - Electronic data communication systems
- Pre-positioning Monitoring and Assessment response teams can provide very early detection and assessment for public dose avoidance.

Backup Reference Material


LEICATRACKER
FLAMMABLE
INFLAMMABLE

Who's your daddy?